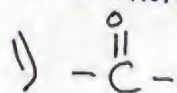


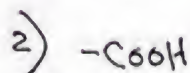
Identification of Organic Compound

* Functional group:-

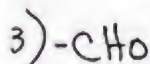


Type of Compound

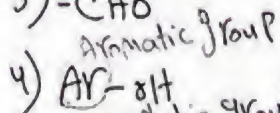
Ketone



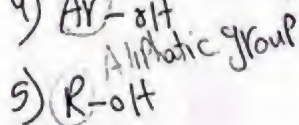
Acid



Aldehyde



Phenol



Alcohol

* Physical Properties:-

Color:

Shape:

Solubility:- For solids \Rightarrow Solubility in H_2O
For liquids \Rightarrow Miscibility with H_2O

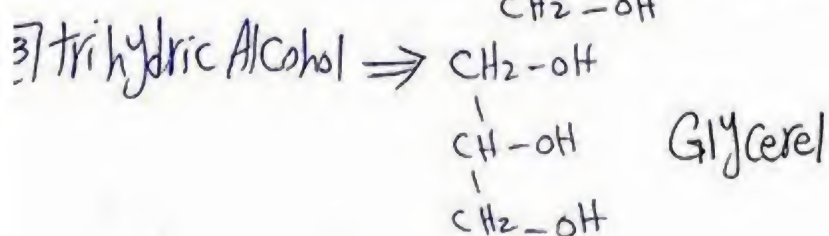
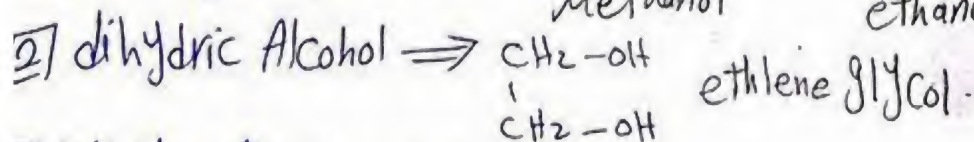
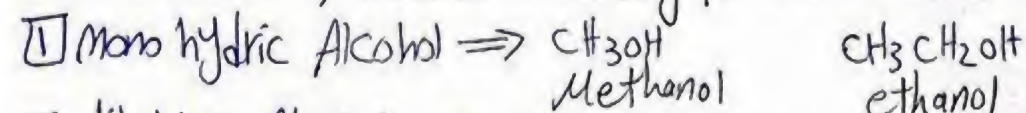
Miscible in H_2O

Immiscible in H_2O

* Identification of Alcohols

* Alcohol :- organic compound in which (-OH) group is directly attached to an aliphatic part (R-OH)

Classification of Alcohols according to the no. of (-OH) groups:-



* Identification of Methanol and ethanol :-
* Physical Properties :-

* Color \Rightarrow colorless

* Shape \Rightarrow liquid

* ~~Solubility~~ Miscibility with $H_2O \Rightarrow$ Miscible in H_2O

2 Chemical Properties

[a] Oxidation reaction

[b] Esterification reaction

[3] Iodoform reaction

[a] Oxidation reaction

$R-CH_2-OH$ 1° alcohol

$\begin{matrix} R \\ | \\ R-CH-OH \end{matrix}$ 2° alcohol

$\begin{matrix} R \\ | \\ R-C-OH \\ | \\ R \end{matrix}$ 3° alcohol

\Rightarrow Primary and 2° alcohol are only oxidized but 3° alcohol not, due to absence of hydrogen.

1° alcohol $\Rightarrow R-CH_2-OH \xrightarrow{[O]} R-CHO \xrightarrow{[O]} RCOOH$
 Aldehyde Acid

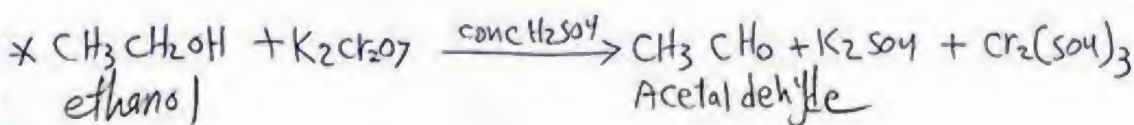
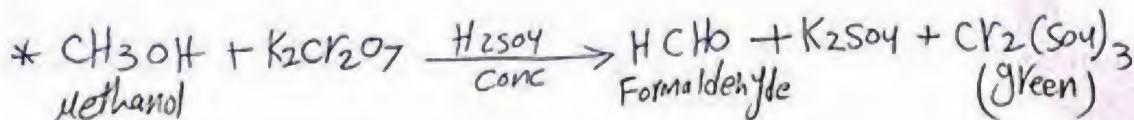
2° alcohol $\Rightarrow \begin{matrix} R \\ | \\ R-CH-OH \end{matrix} \xrightarrow{[O]} \begin{matrix} R \\ | \\ R-C=O \end{matrix}$ Ketone

3° alcohol \Rightarrow no reaction

طريقة للفرقة بين أنواع الكحول

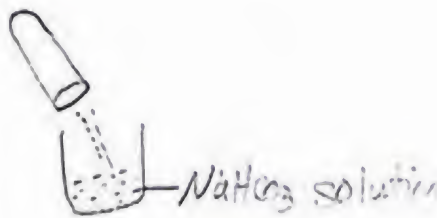
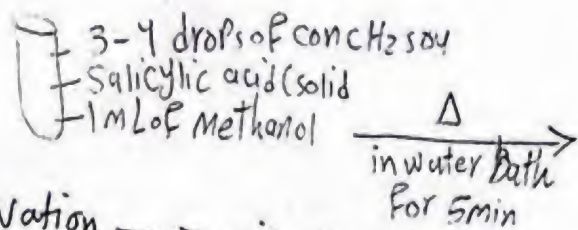
Procedure:-

droplets of conc H_2SO_4 .
 0.5 ml of $K_2Cr_2O_7$ (orange)
 0.5 ml of alcohol $\xrightarrow{\text{obs.}}$ orange $\xrightarrow{\text{convert to}}$ green.

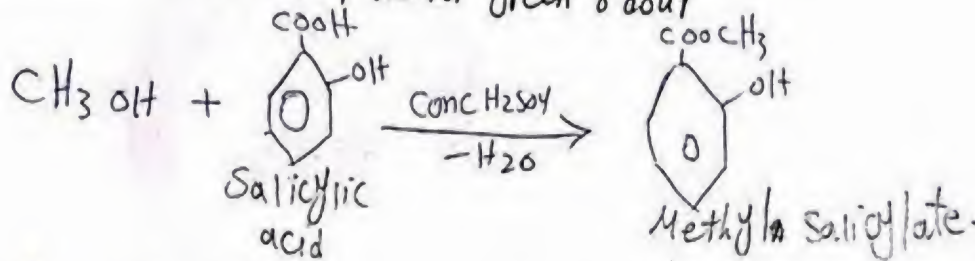


D) esterification reaction :- reaction between Alcohol and an acid to give ester + water

Procedure :- For Methanol

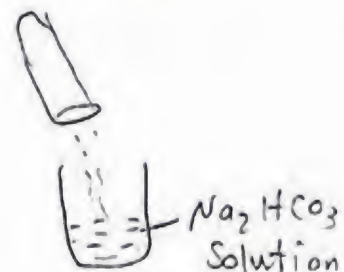
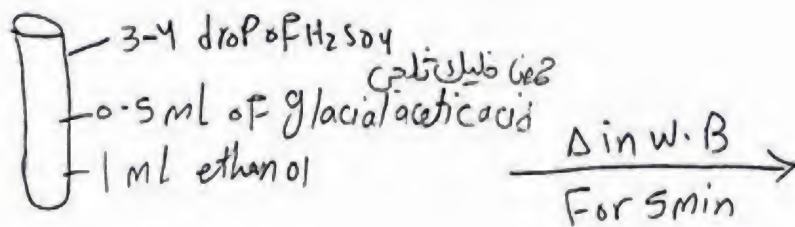


Observation \rightarrow oil of winter green & sour

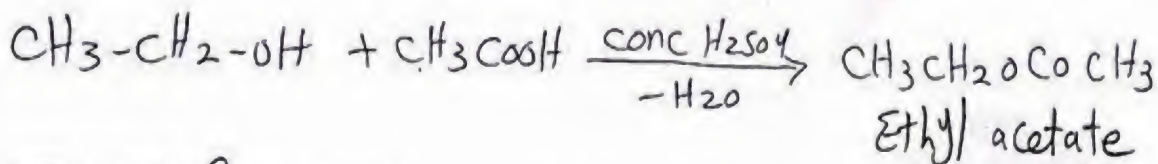


طريقة أخرى للتفريق بين الإيثانول والميثانول

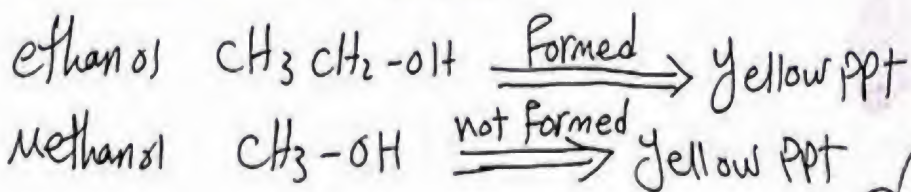
Procedure for ethanol :-



Observation Fruity odour



[E] Iodoform reaction :- Iodide compound formation $CHI_3 \downarrow$ yellow ppt
 Iodoform reaction occurs with alcohols that contain free methyl group attached to α -carbon.



طريقة أخرى للتفريق بين الإيثانول والميثانول

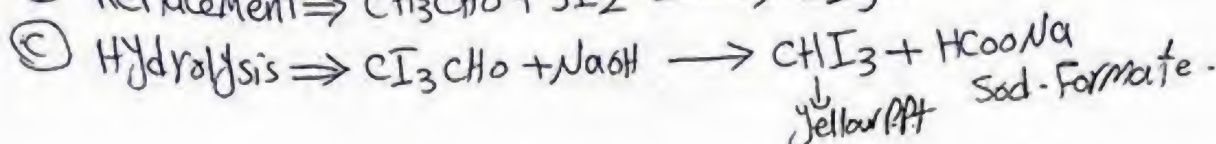
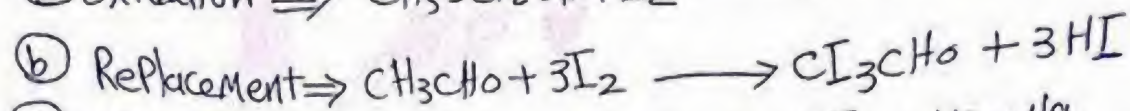
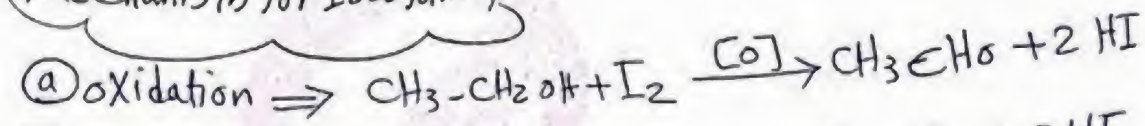
Reagents:

add NaOH solution drop by drop with shaking till yellow color
6ml I₂ solution (dark brown)
1ml ethanol

$\xrightarrow[\text{in w.B for 15 min}]{\Delta}$

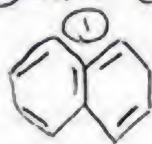
Cooling \Rightarrow Yellow ppt

Mechanism for Iodoform

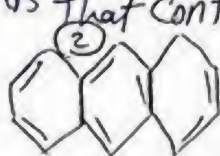


Identification of Hydrocarbon

* Organic compounds that contain C, H only.



Naphthalene



Anthracene

Physical Properties :-

Color :- (1) white (colorless)

(2) colorless (white) or faint yellow

Shape :- crystal

Solubility in H₂O \Rightarrow insoluble in H₂O

Chemical Properties

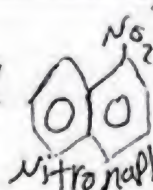
[1] Nitration test (Test of aromaticity)

0.5ml of HNO₃ conc
0.5ml of conc H₂SO₄
organic solid

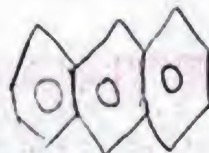
$\xrightarrow{\Delta}$ Warm on flame till evolution of reddish brown vapour



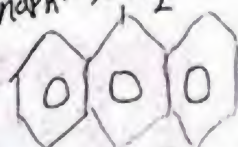
conc H₂SO₄
conc HNO₃



Nitronaphthalene



conc H₂SO₄
conc HNO₃

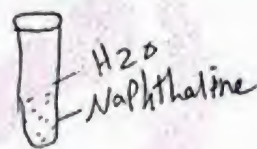


Nitroanthracene

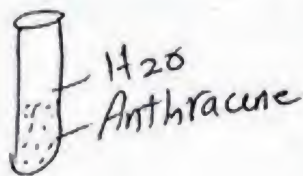
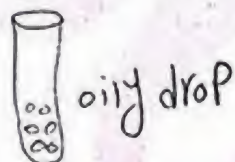


H₂O (Positive)
any color or any ppt
or any oily drops

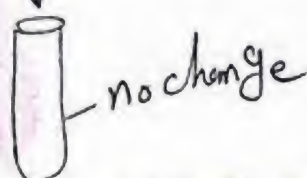
② Action of H_2O



Δ boil



Δ boil



- * Melting Point of Naphthalene $<$ BP of water, so it melt and form oily drops
M.P. of Naphthalene = $76^\circ C$
- * M.P. of Anthracene $>$ B.P. of water, so No change occurs
M.P. of Anthracene = $200^\circ C$

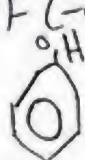
Identification of Phenol

Phenol :- An organic compound in which $(-OH)$ group is directly attached to Aromatic group.

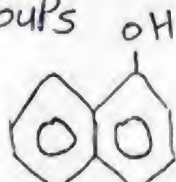
* Classification of Phenol

(I) According to the no. of $(-OH)$ groups

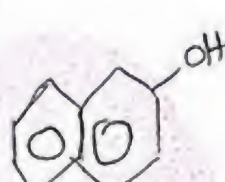
(a) Monohydric Phenol



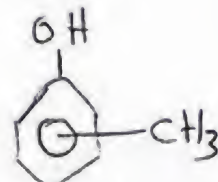
Phenol



α -Naphthol

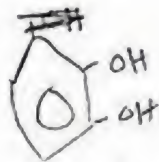


β -Naphthol



Cresol

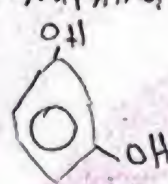
(b) dihydric Phenol



Catechol

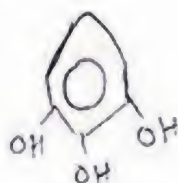


Resorcinol

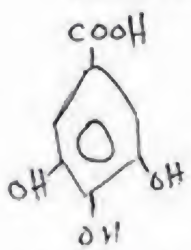


Hydroquinone

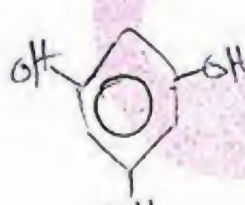
(c) trihydric Phenol



Pyrogallol



Gallic acid



Phloroglucinol

2 according to solubility in H_2O

① water soluble Phenols \Rightarrow All Di / All try hydric Phenols are water soluble in addition to phenol because its m.wt is small

Solubility \propto no. of $(-OH)$
 $\propto \frac{1}{m.wt}$

② water insoluble Phenols \Rightarrow All Mono hydric Phenols are water insoluble except Phenol.

* Physical Properties

① Shape :- All Phenols are solids except Phenol

\downarrow Pure (solid crystal) \downarrow impure (liquid)

② Color : all Phenols are color except Phenol

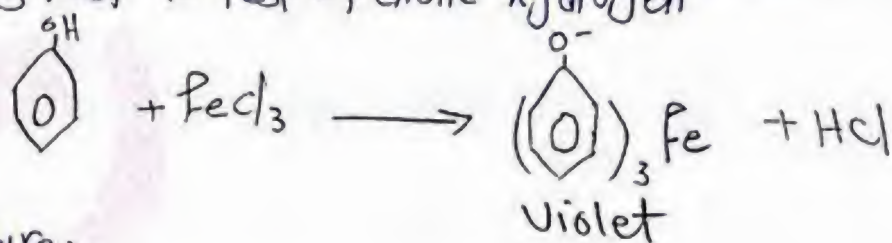
\rightarrow Pure (colorless)
 \rightarrow impure (red)

③ solubility in water

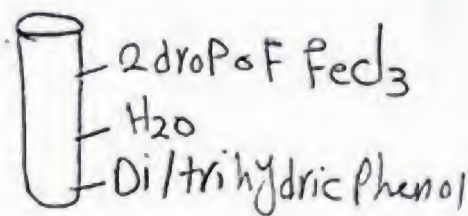
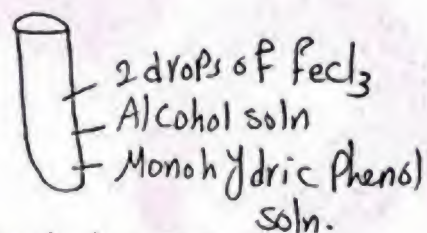
Chemical Properties

Compound Test	Phenol	α -Naphthol	β -Naphthol	Catechol	Resorcinol	Hydroquinone	Pyrogallol
$FeCl_3$ Test	Violet color	Brown color excess $\downarrow FeCl_3$ violet	Pale green color excess $\downarrow FeCl_3$ violet	green color	Violet color	green ppt	red color
Phthalin test	Pink color	Pale green color	Pale green Fluorescence	Blue color	reddish solution + green Fluorescence	Blue violet color	-ve
Azodye test	scarlet red ppt	reddish brown ppt	scarlet red ppt	-ve	deep red ppt	-ve	-ve

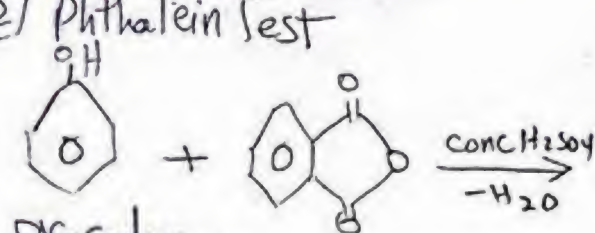
[1] $FeCl_3$ Test :- Test of Phenolic hydrogen



Procedure:-

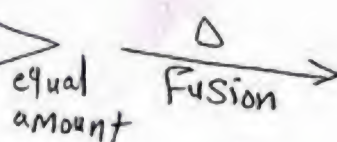
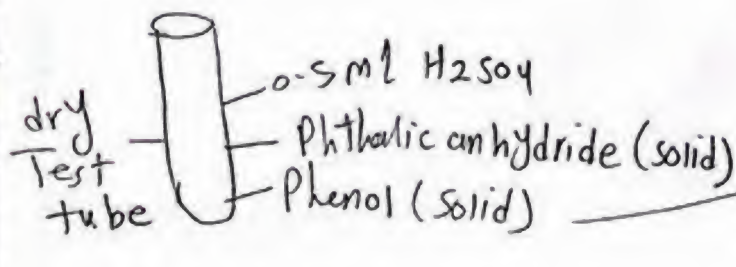


[2] Phthalic Test



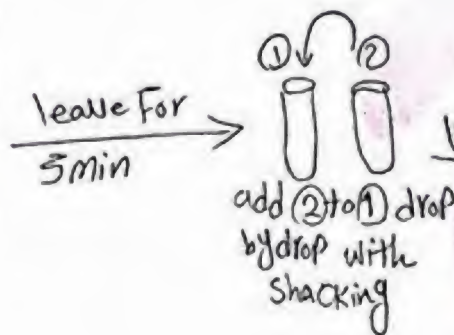
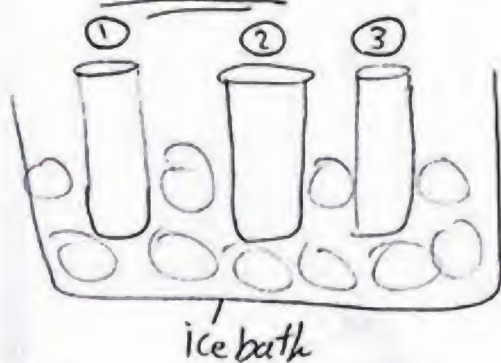
Procedures:-

Ph-Ph in acidic med.



[3] Azodye Test

Procedure



① 0.5 ml aniline
+ 3 ml H_2O
+ 1 ml conc HCl

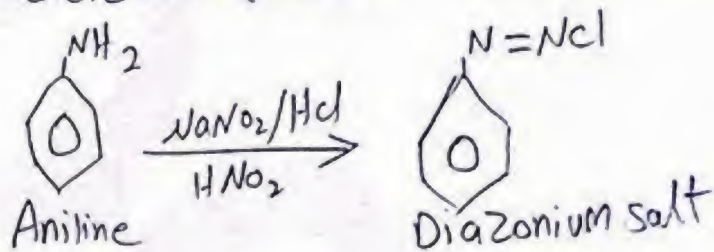
② $NaNO_2$ Solution (نیترید سولوشن)

③ $NaOH$ Solution
+ Phenol (solid)

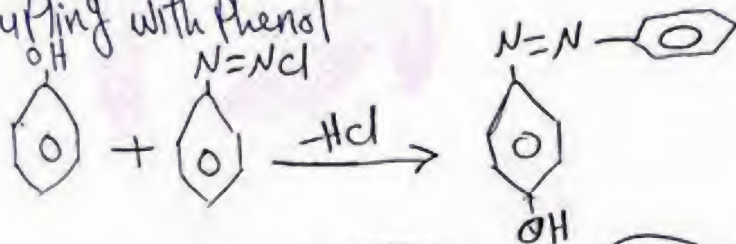
[7]

Mechanism of azodye:-

① Diazodization (Formation of diazonium salt)



② Coupling with Phenol



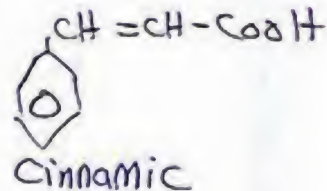
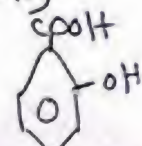
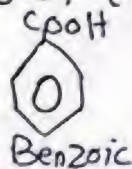
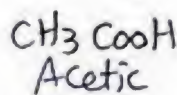
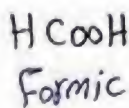
Identification of Acids

Carboxylic acid \Rightarrow organic compound contain $(-\text{COOH})$

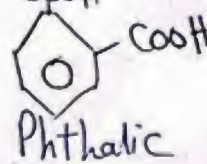
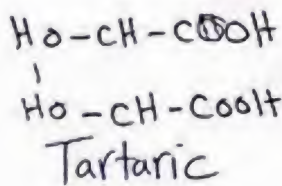
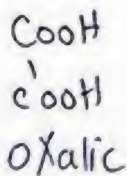
* organic acid are weak ($\text{CH}_3\text{COOH} \rightarrow \text{CH}_3\text{COO}^- + \text{H}^+$)

* Classification of acids according to No. of $(-\text{COOH})$

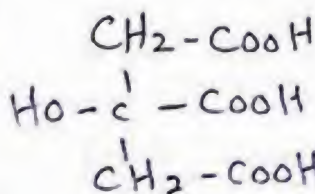
① Mono



② Di



③ Tri



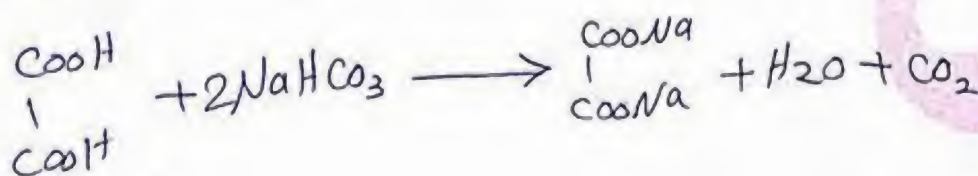
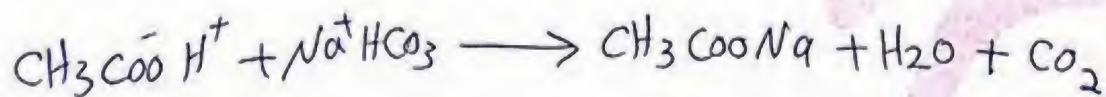
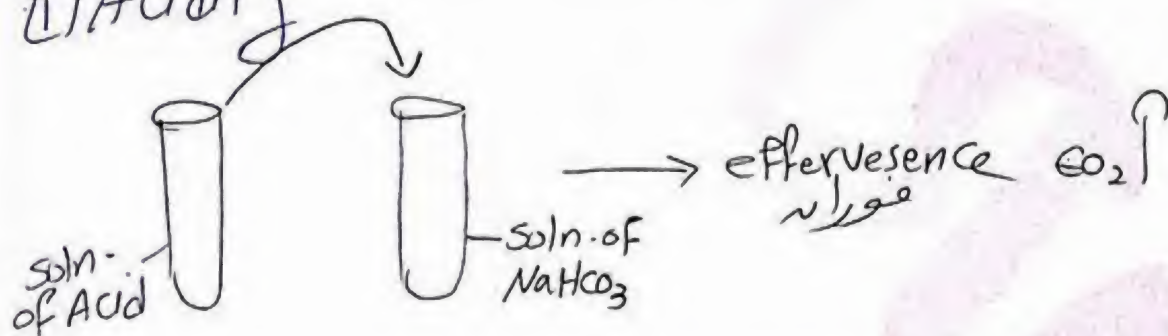
* classification according to type:-

① Aliphatic \Rightarrow Formic, Acetic, Oxalic, tartaric, citric

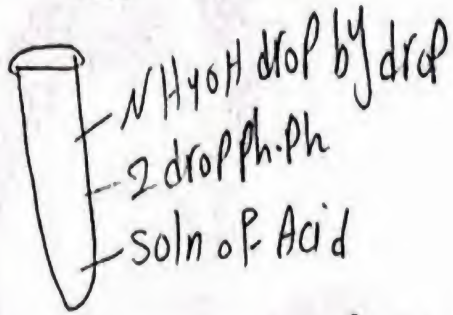
② Aromatic \Rightarrow Benzoic, Salysalic, Phthalic, cinnamic

Test	Formic	acetic	oxalic	tartaric	citric
Acidity	eff	eff	eff	eff	eff
N.S + FeCl ₃	red brown	red brown	-ve	-ve	-ve
N.S + FeCl ₂	-ve	-ve	white ppt at once	white ppt after scratching	white ppt after boiling
KMnO ₄	decolorized	-ve	Dicolorization		
Solid + H ₂ SO ₄	-ve	-ve	No reaction (clear)	black	yellow
Fenton's Test	-ve	-ve	-ve	violet	-ve
Dengel's Test	-ve	-ve	-ve	-ve	Dicolorization

Acidity

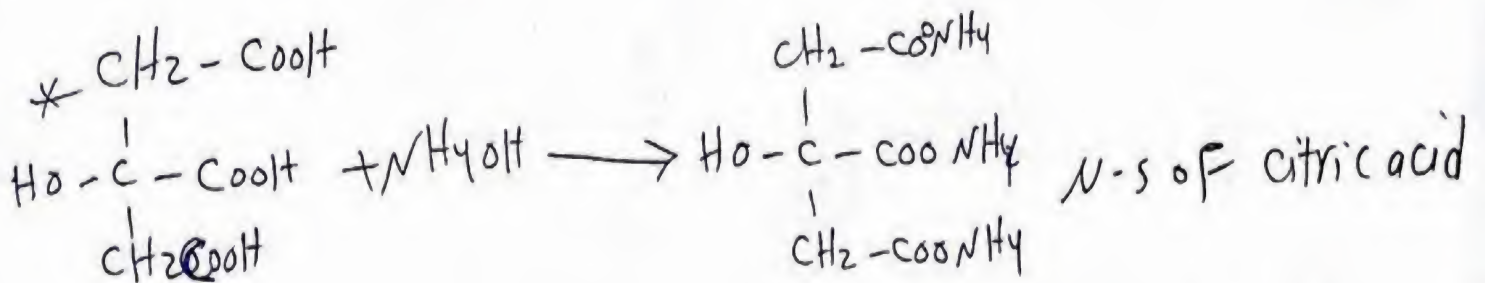
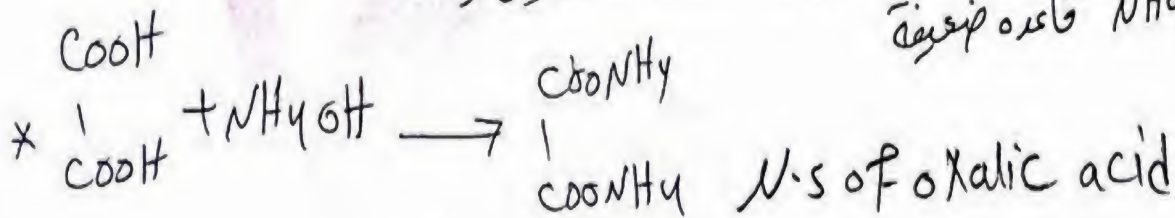


* Neutral Soln.

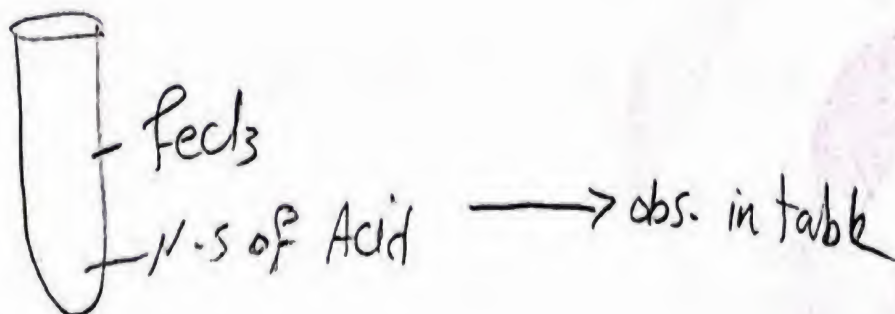


Colorless \rightarrow Faint Pink $\xrightarrow{\Delta}$ Colorless $\xrightarrow{\text{cooling}}$ colorless

علل) نستعمل NH₄OH بدل NaOH
لأنه NaOH قاعده قويه معروفه
أما NH₄OH قاعده ضعيفه
أختص منها لوني زياده

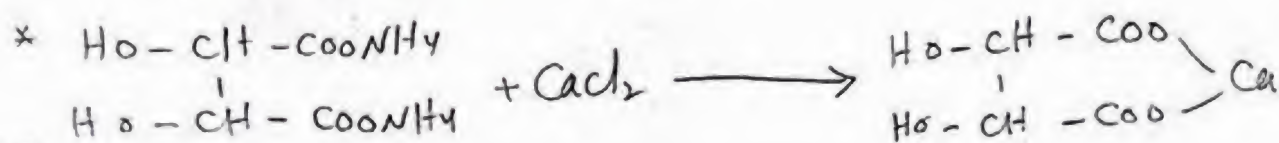
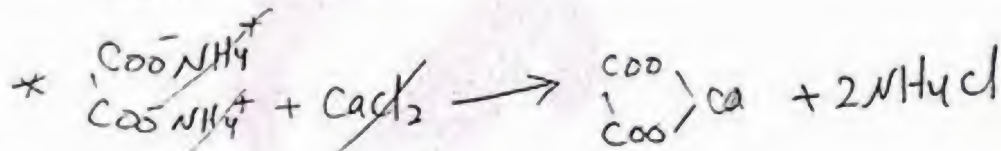
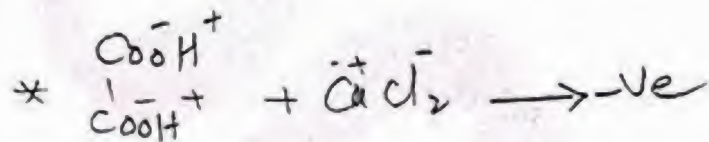


[2] N.s + FeCl₃



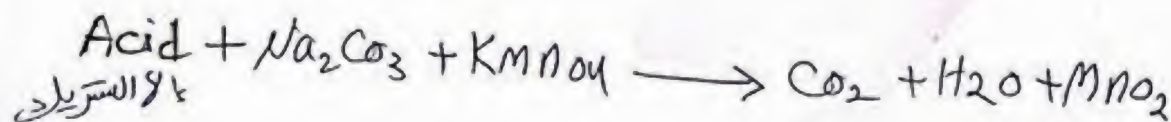
[3] N-S + CaCl₂

CaCl₂ 1mL
N-S of acid obs. in table

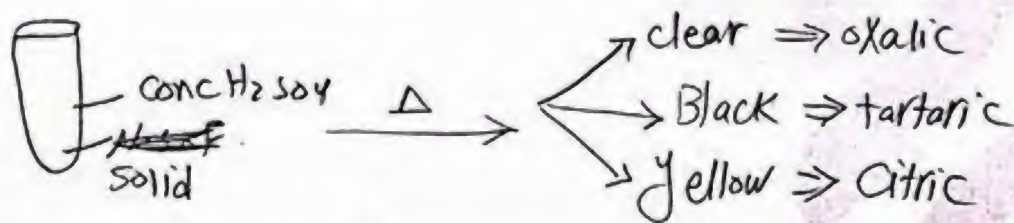


[4] KMnO₄ Test

KMnO₄ drops
Na₂CO₃ (solid)
N-S of acid \rightarrow DeColorization

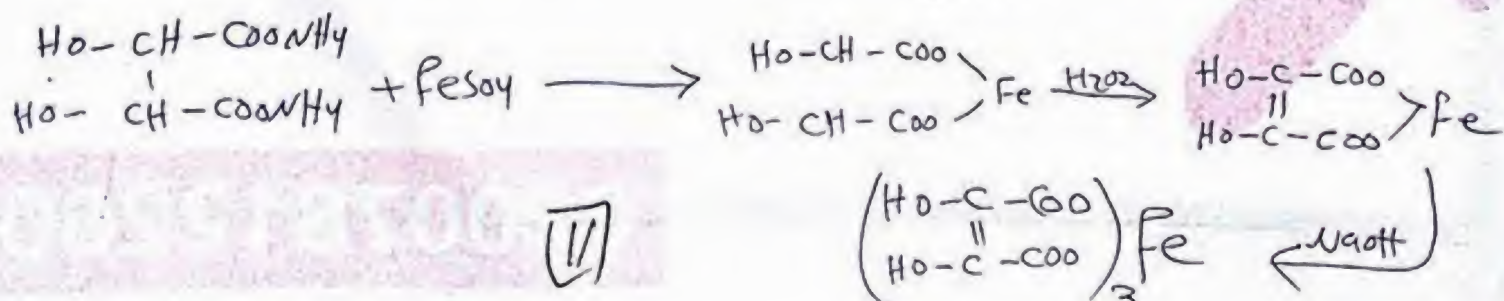


[5] H₂SO₄ + Solid Test

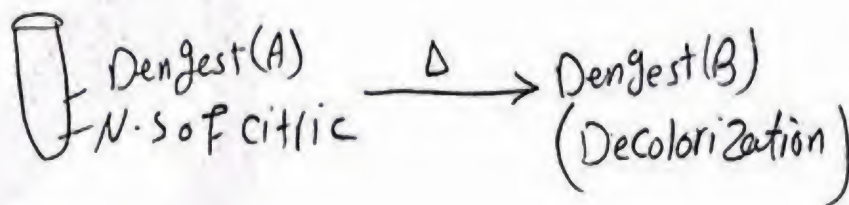


[6] Fenton's Test كالا استريد

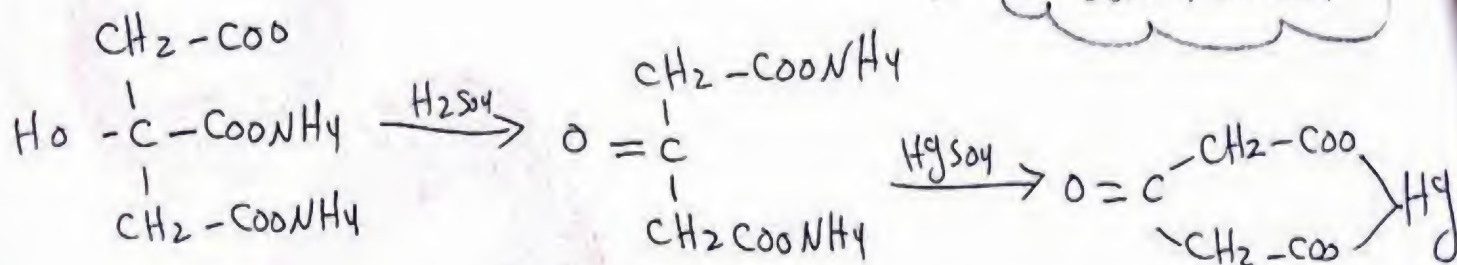
H₂O₂ drop by drop
FeSO₄
N-S of tartaric } Green \rightarrow colorless $\xrightarrow[\text{by drop}]{\text{NaOH drop}}$ Violet



⑦ Denges Test اختبار دنجس



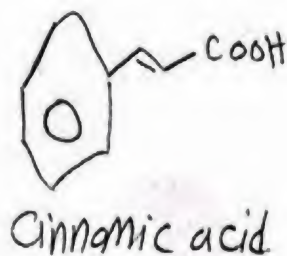
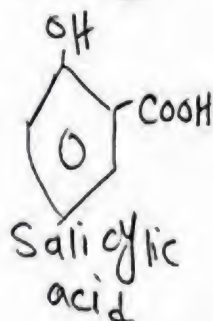
Dengest A \Rightarrow
 $HgSO_4 + H_2SO_4$
 Dengest B $\Rightarrow KMnO_4$



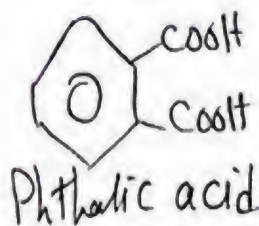
Identification of Aromatic Carboxylic acids Ar-COOH

* Classification according to the number of (-COOH) group

① Mono Carboxylic acid



② Di Carboxylic acid



* Physical Properties

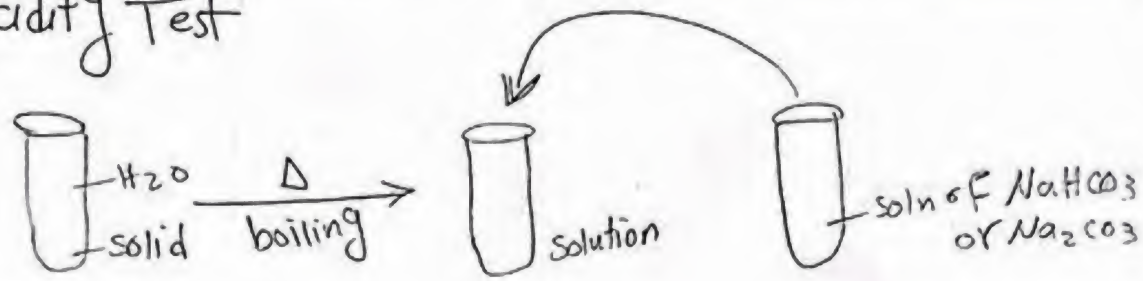
Color \Rightarrow white

Shape \Rightarrow crystal

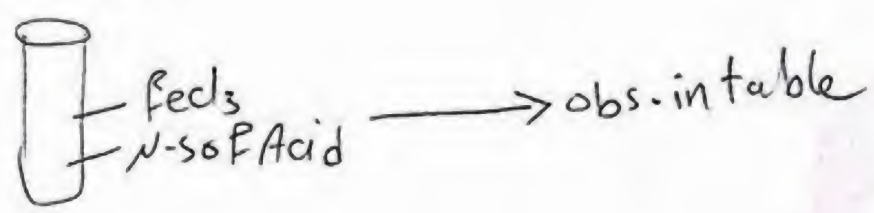
Solubility \Rightarrow insoluble in H_2O

Compound	Benzoic	Salicylic	Phthalic	Cinnamic
Test				
1] Acidity Test	eff	eff	eff	eff
2] $FeCl_3$ Test	Buff PPT	Violet color	Buff PPT	Buff PPT
3] Phthaline Test	-ve	Pink color	Pink color	-ve
4] Azodye Test	-ve	Red PPT	-ve	-ve
5] unsaturation Test	-ve	-ve	-ve	Decolorization

1] Acidity Test

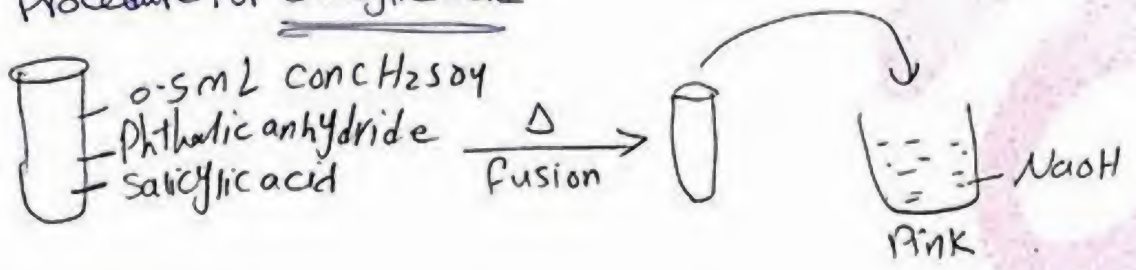


2] $FeCl_3$ Test

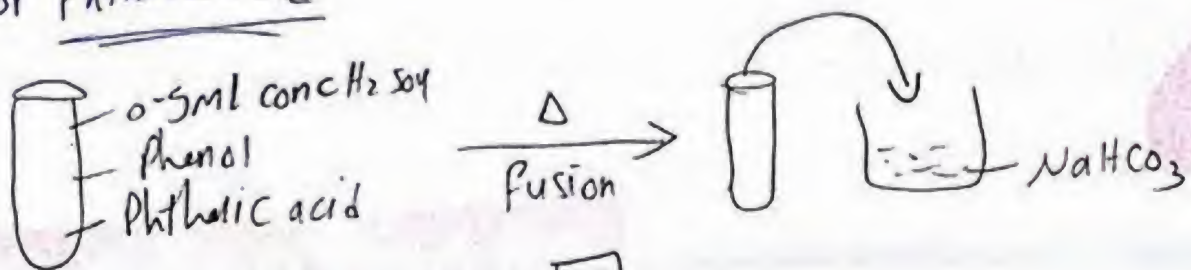


3] Phthalin Test.

Procedure For Salicylic acid



For Phthalic acid



[4] Azodye Test نقش الخطوات من الفينول مع استبدال الفينول بـ Salicylic

[5] unsaturation Test

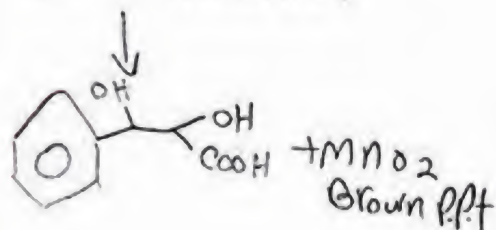
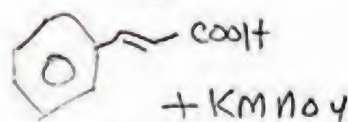
Detect the Presence of $(=)$ or (\equiv) rather than the aromatic system

Procedure

① $KMnO_4 / Na_2CO_3$

1 drop of $KMnO_4$
soln of Na_2CO_3
soln of cinnamic acid

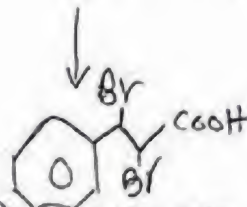
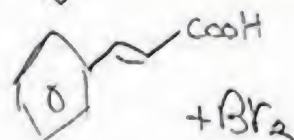
↓ decolorization



② Br_2 / CCl_4

1 drop of Br_2
 CCl_4
cinnamic acid (solid)

↓ decolorization



Scheme For Identification of Carboxylic acid

unknown acid

① solubility Test

soluble in H_2O
(Aliphatic acid)

Aliphatic acid
 $N.S + CCl_2$

insoluble in H_2O
(Aromatic acid)

white ppt at once
(Oxalic)

white ppt after scratching
(Tartaric)

white ppt after boiling
(Citric)

clear

Conc H_2SO_4

↓
yellow
Black

↓
Fenton's

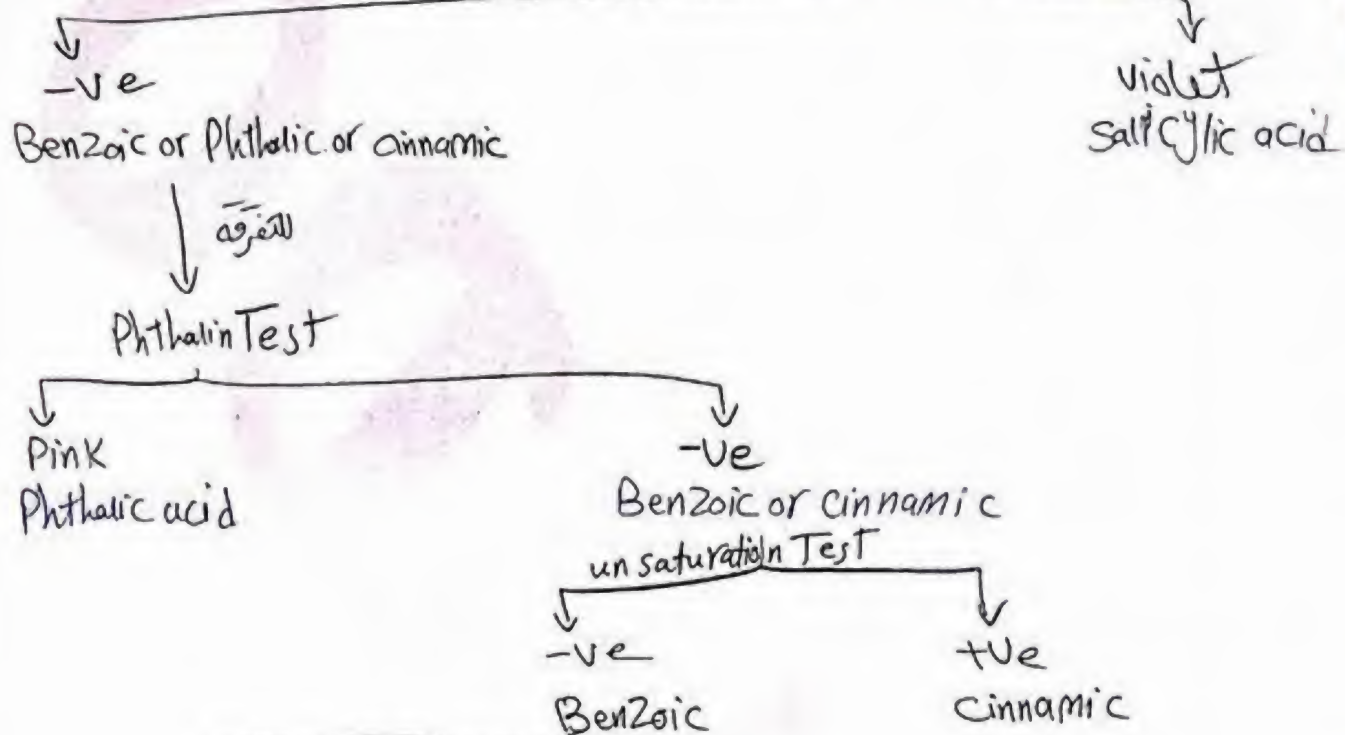
yellow

↓
Deng's Test

[14]

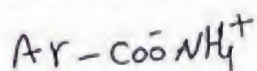
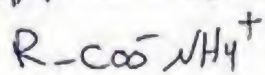
2] Aromatic acid

Soln + FeCl_3

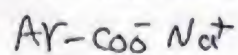
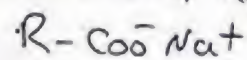


Identification of salt of acid

Ammonium salt of Acid



Sodium salt of acid



Notes

- ① All Salt of acid are solids
- ② All salt of acid are water soluble
- ③ All salt of acid give (-ve) acidity Test

* Physical Properties

Color: White

Shape: Powder / crystal

Solubility in $\text{H}_2\text{O} \Rightarrow$ Soluble in H_2O

Scheme For salt of HCl

unknown salt

Solid + NaOH (40%)

Ammonia odour

↓
Amm. salt of Acid

No. Ammonia odour

↓
Sod. salt of acid

Soln + Conc HCl

No ppt

Ammonium salt of Aliphatic acid

white ppt

Ammonium salt of Aromatic Acid

Soln + CaCl_2

white ppt in cold
(Amm. oxalate)

white ppt after scratching
(Amm. tartarate)

white ppt after boiling
(Amm. Citrate)

Solid + H_2SO_4 conc

↓
Fenton's Test

↓
Deng's Test

Soln + FeCl_3

Buff ppt
(Amm. Benzoate, Phthalate, cinnamate)
Phthaline Test

Violet color
(Amm. Salicylate)

Pink color
(Amm. Phthalate)

-ve
(Amm. Benzoate or cinnamate)

↓
unsaturation Test

+ve
(Amm. cinnamate)

-ve
(Amm. Benzoate)

Notes

اسکیم اُملاح الصوديوم هي نفسها الامونيوم
مع استبدال المقطع. بالقطعة Sod.
قبل تسوية كد ملاح